



Clinical radiology

Northern Ireland workforce 2019

summary report

August 2020

Foreword	3	3. Workforce forecast illustrated – next five years	8
-----------------	----------	--	----------

Executive summary	4	4. Workforce demand	10
Objectives	4	Estimated costs of outsourcing and insourcing	10
Key findings	4	Estimated shortfall of consultant clinical radiologists in Northern Ireland in 2019	11
Recommendations	5		

1. The radiology workforce in Northern Ireland in 2019	6	5. Workforce scenarios and potential solutions for Northern Ireland	13
Interventional radiology	6		

2. Workforce supply and attrition	7	References	14
Clinical radiology specialty training	7		
Overseas recruitment	7	Appendix A. Regional workforce data table	15

Foreword

This report conveys the findings of Northern Ireland data collected for the RCR annual workforce census in late 2019. Since then, COVID-19 has changed many aspects of healthcare. However, the workforce shortages outlined in this report remain highly relevant. Meeting the ongoing demand for diagnostic and interventional radiology (IR) is essential to ensure patients receive the best possible care as the NHS recovers and learns from COVID-19. However, workforce shortages in a changing and challenging environment are making it exceptionally difficult for radiology departments to provide safe and effective patient care. For example, following the decision to pause elective procedures during the pandemic, many radiology departments are now facing huge backlogs of imaging examinations. Where those departments are understaffed, this exacerbates the risk of patients not getting the prompt diagnoses and treatment they need.

Clinical directors of radiology departments at three of the five Northern Ireland trusts stated there are still not enough consultant clinical radiologists to deliver safe and effective care. With an estimated shortfall of 52 clinical radiology consultants (27%), outsourcing and insourcing costs have increased to an estimated £9.3 million in Northern Ireland in 2019. Due to upcoming retirements and insufficient trainees, workforce shortages in Northern Ireland are likely to rise unless mitigating action is taken.

This report highlights particular difficulties in chest/lung and IR, where services are under intense pressure. Increased recruitment to these areas is vital. IR is an acute problem, with insufficient consultants to provide these lifesaving procedures on a 24/7 basis. This is unsafe and puts patients at risk. The estimated shortage of IR consultants in Northern Ireland is 15 (46%).

There have been welcome increases in clinical radiology specialty training places in Northern Ireland in recent years. However, these increases have been insufficient to meet the rising demand for diagnostic and interventional radiology. To ensure our patients receive the best possible care, we need more specialist training places and more flexible working patterns to improve staff retention. In addition, innovative delivery models and streamlined patient pathways are required to ensure that every patient receives the right imaging examination at the right time.

Professor Mark Callaway

Medical Director, Professional Practice, Clinical Radiology

Dr Mark Love

Chair of the Northern Ireland Standing Committee, Clinical Radiology

Executive summary

Objectives

This report provides details of the radiology workforce in Northern Ireland in 2019, with a focus on the estimated shortfall of consultant clinical radiologists and workforce forecasts over the next five years. It goes on to make recommendations on how to tackle the radiology workforce shortage in Northern Ireland. Closing the gap between the radiology workforce supply and demand is essential to support safe and effective care for patients.

This report for Northern Ireland supplements the *Clinical radiology UK workforce census 2019 report*.¹ Please refer to the UK report for UK-wide radiology trends and information such as census timings and methodology.

Key findings

Workforce shortages in clinical radiology are negatively affecting patient care in Northern Ireland by delaying the diagnoses and treatment of many conditions, including cancer, and restricting the availability of minimally invasive interventional radiology procedures. This has implications for patient safety. Of concern, clinical directors at three out of the five trusts in Northern Ireland feel there are not enough consultant radiologists to deliver safe and effective patient care.

Furthermore, workforce shortages are pushing up NHS outsourcing, insourcing and locum costs to the extent that this expenditure in Northern Ireland in 2019 reached an estimated £9.3 million.* For context, £9.3 million is equivalent to the combined salaries of approximately three-quarters of the consultant clinical radiologist workforce in Northern Ireland.²

Workforce shortages are putting the radiology workforce in Northern Ireland under immense pressure, significantly increasing the likelihood of stress and burnout and staff leaving the profession, further exacerbating workforce shortages in Northern Ireland.

This report estimates that there is a current shortfall of 52 whole-time equivalent (WTE) consultant clinical radiologists in Northern Ireland.** This is equivalent to a 27% shortfall, indicating severe workforce shortages. The situation is likely to worsen, as a fifth of consultant clinical radiologists in Northern Ireland are forecast to retire within five years and there are insufficient trainees to fill current vacancies, let alone pending vacancies. At a time when there is continued growth in demand for diagnostic and interventional radiology, it is clear that patients will be adversely affected unless further action is taken to rectify the radiology workforce shortages in Northern Ireland.

This report highlights that, while there is a severe shortage of consultant clinical radiologists across Northern Ireland, the shortage is particularly severe for some specialists. Of particular concern:

- There is a severe shortage of interventional radiologists in Northern Ireland, estimated to be 46% (n=15); this is unsafe and puts patients at risk.
- The shortage of chest/lung radiologists in Northern Ireland is likely to increase rapidly over the coming five years, as many specialists are approaching retirement age and few of the newly qualified consultant clinical radiologists are choosing to specialise in this area.

*Insourcing is defined as additional paid reporting by health board radiologists outside of their contracted hours.

**A WTE is a whole-time (or full-time) doctor contracted for ten programmed activities (PAs) per week, equivalent to a 40-hour week.

Recommendations

The COVID-19 era has highlighted diagnostics and interventional radiology as being vital to the NHS. The increase in training numbers in recent years, while welcome, is not sufficient to close the growing gap between supply and demand for radiology services.

To address radiology workforce shortages in Northern Ireland, our recommendations are:

- **Increase training places:** the number of clinical radiology training places needs to be increased further, including additional funding for interventional radiology posts, as soon as is practical following the COVID-19 recovery period. Radiology remains a popular specialty among doctors in Northern Ireland; training posts are oversubscribed so increased numbers can easily be achieved with adequate funding
- **More flexible working patterns:** NHS employing organisations should adopt more flexible working patterns, including working from home, to increase staff morale and improve staff retention at all levels. The ability to work from home with a fully integrated picture archiving and communication system (PACS) workstation is likely to improve staff retention and would provide greater flexibility to deal with unforeseen circumstances such as the COVID-19 pandemic
- **Development of an academy:** a Northern Ireland radiology academy could provide a centre of excellence for training, allowing expansion of the training programme while fully utilising the radiology expertise and experience available within hospitals in Northern Ireland. It would also support much needed multiprofessional training for imaging teams
- **Increase staff retention:** targeted action should be taken to incentivise staff approaching retirement age to stay within the NHS, rather than taking early retirement
- **Effective use of locums:** consideration should be given to incentivising long-term locums to take up substantive posts. This could add stability to the workforce (and potentially reduce costs).

Proactive measures should be undertaken to ensure targets for report turnaround times are met to ensure the safety of patients.

1. The radiology workforce in Northern Ireland in 2019

There were 144 consultant-grade radiologists employed by five acute trusts in Northern Ireland in September 2019. This includes NHS, academic and mixed NHS/academic posts.

Table 1. Clinical radiology workforce (headcount) – UK countries, 2019

	England	Northern Ireland	Scotland	Wales	UK total
Consultant-grade	3,415	144	347	171	4,076
Specialty trainee	1,355	51	158	72	1,636
SAS-grade	77	0	4	3	83
Total	4,846	195	509	246	5,795

[SAS-grade comprises associate specialists, specialty doctors and trust-grade staff.]
[Due to rounding, numbers in this table may not add up precisely to the totals provided.]

Taking into account the contracted hours of less than full-time (LTFT)* doctors, the total of 144 consultant clinical radiologists in Northern Ireland equates to 137 WTEs.

Over the past five years, workforce growth in Northern Ireland has averaged 3% per year, compared to 4% seen across the UK as a whole. However, over the past year, workforce growth in Northern Ireland has increased, with an additional 11 WTE consultant clinical radiologists joining the workforce, equivalent to 9% growth.

Specialty trainees comprise 26% of the radiology workforce in Northern Ireland, compared to 29% of the UK workforce as a whole.

There is variability across the UK in terms of WTE consultant clinical radiologists per 100,000 population; the UK average is 5.6, Wales has 5.0 and Northern Ireland has 7.2. It should be noted that these figures are simplistic; they give a broad indication of the relative supply of consultant clinical radiologists across regions or countries, but do not take into account any local factors which may increase or decrease the local demand for radiology services. Taking into account the severe clinical radiology workforce shortages across the UK, it should be noted that regions, or countries, with a relatively high number of consultants per population compared to the UK average may still have significant shortages.¹

Interventional radiology

Interventional radiology (IR) is a subspecialty of clinical radiology. Interventional radiologists perform minimally invasive image-guided procedures, including emergency treatment for patients with bleeding, sepsis and stroke. The demand for IR has increased over many years, as has the range and complexity of IR procedures. However, with ongoing workforce shortages, IR provision remains patchy in Northern Ireland. This puts patients at risk.

Trusts need a minimum of six interventional radiologists (IRs) (WTE) to provide an effective and sustainable 24-hour IR service.³ Alternatively, health boards need formal arrangements in place to transfer patients to other trusts for IR procedures. Two of the five trusts in Northern Ireland did not meet these requirements in 2019. To meet these standards, census data indicate that the minimum number of additional WTE IRs required in Northern Ireland is 15. This equates to a 46% shortfall of interventional radiologists in Northern Ireland.

*LTFT is defined as working fewer than ten PAs (equivalent to a contract of 40 hours) per week.

2. Workforce supply and attrition

Twenty-seven funded consultant clinical radiologist vacancies were reported in Northern Ireland in September 2019. This equates to a vacancy rate of 16% – higher than the UK vacancy rate of 11%. However, as highlighted in the UK report, vacancies reported through the annual census significantly understate the true extent of clinical radiology workforce shortages. Vacancies may be restricted due to lack of funding or lack of suitable candidates, or may be postponed to allow internal candidates time to complete their specialty training. In Northern Ireland, approximately three-quarters of vacancies have been unfilled for a year or more, indicating a severe shortage of suitable candidates. The high outsourcing and insourcing costs in Northern Ireland (£9.3 million in 2019) indicate severe workforce shortages in Northern Ireland, not fully reflected in the 16% vacancy rate.

The supply of new consultant clinical radiologists in Northern Ireland most frequently comes from specialty training within Northern Ireland. However, overseas recruitment (or recruitment from the rest of the UK), has had recent success in some trusts.

Clinical radiology specialty training

RCR training data show that, on average, ten doctors have started specialty training in clinical radiology in Northern Ireland each year, over the past three years. Clinical radiology trainees in Northern Ireland take an average of five years and five months to complete their specialty training and gain a Certificate of Completion of Training (CCT). A small number of trainees (on average one per cohort, equal to 10%) withdraw and do not complete their clinical radiology training.

Over the next five years, it is estimated that 33 doctors (WTE) will take up consultant clinical radiology posts in Northern Ireland following completion of specialty training; approximately seven are expected to join the workforce each year. This forecast accounts for expected attrition, including an estimated 12% who will complete their specialty training but not take up consultant posts in Northern Ireland.* Seven newly appointed consultant clinical radiologists (WTEs) in 2020 is insufficient to fill even one-third of the 27 funded vacancies reported in 2019. Current training numbers are clearly inadequate to cover current vacancies, let alone gaps resulting from upcoming retirements and rising demand.

Overseas recruitment

Radiology departments in Northern Ireland are turning to overseas recruitment to try to fill consultant clinical radiologist posts. In 2019, three of the five trusts in Northern Ireland attempted to recruit from overseas. However, overseas recruitment has proven difficult, with only one trust reporting any successful recruitment attempts in 2019.

**The estimate of 12% is based on UK data over the past five years. Attrition in Northern Ireland varies from year to year and may differ from this figure.*

3. Workforce forecast illustrated – next five years

The size of the consultant clinical radiology workforce in Northern Ireland is determined by entrants from UK specialty training and recruitment from overseas, set against attrition from retirements and other leavers and the trend towards LTFT working. This section forecasts the size of the clinical radiology workforce in Northern Ireland in five years' time, based upon these determinants and trends observed in recent years.

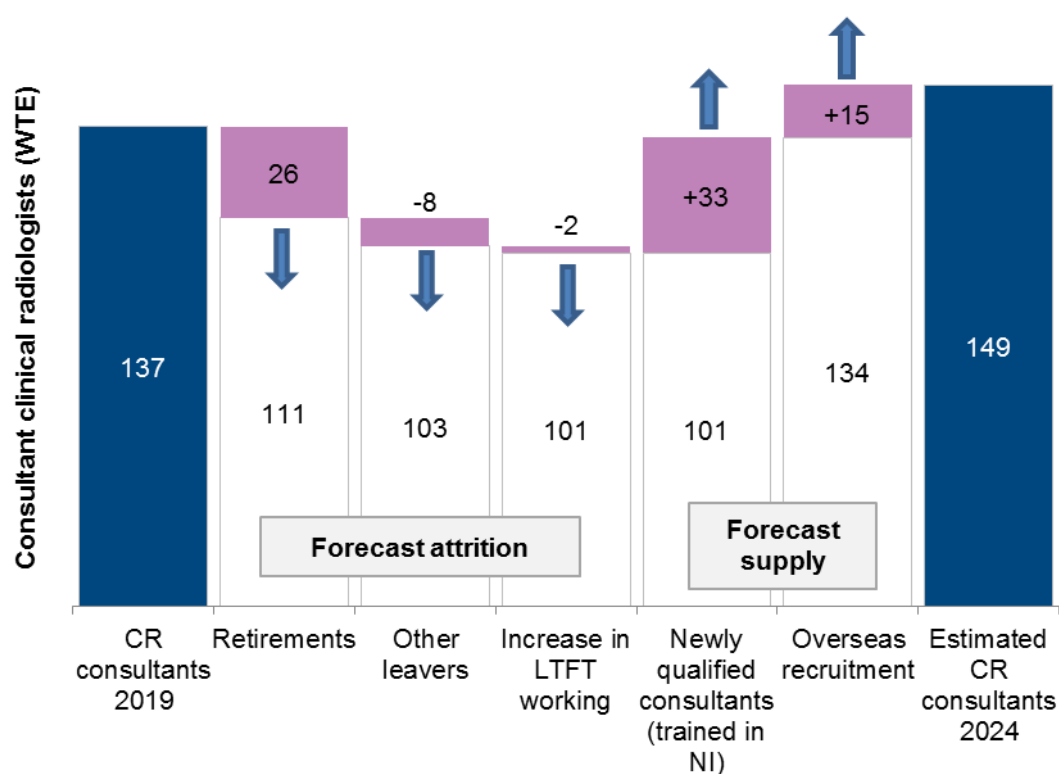
- **UK specialty training:** based on RCR training and census data, the total number of UK-trained consultant clinical radiologists who will join the workforce in Northern Ireland in the next five years is estimated to be 33 WTEs.
- **Overseas recruitment:** if trends from recent years continue, approximately 15 WTE consultant clinical radiologists will be recruited from overseas (or the rest of the UK) to the workforce in Northern Ireland in the next five years.*
- **Retirement:** numbers of consultant clinical radiologists leaving the workforce vary from year to year, but the general trend across the UK over the past five years has been one of increased attrition. The most frequently cited reason for UK consultant clinical radiologists leaving the profession is retirement. The average (median) age of retirement in 2019 in the UK was 60 years. Based on the median retirement age of 60 years, an estimated 26 WTE consultant clinical radiologists in Northern Ireland – equivalent to 19% of the workforce – are expected to retire in the next five years.** This level of attrition will put considerable additional strain on the workforce in Northern Ireland.
- **Other leavers:** assuming the annual attrition rate of 1% for other leavers (excluding retirees) observed over the past five years remains unchanged, attrition in the next five is estimated to be eight consultants (WTEs).
- **Less than full-time (LTFT) working:** the workforce capacity loss due to LTFT working in Northern Ireland has gradually increased from five WTE consultant clinical radiologists in 2014 to seven in 2019. In other words, if all consultant clinical radiologists working LTFT in 2019 were to switch to full-time working, the workforce would increase by the equivalent of seven WTE consultant clinical radiologists. If this gradual trend towards increased LTFT working continues in a linear fashion, the effect will equate to an additional two fewer WTE consultant clinical radiologists in Northern Ireland by 2024.
- **Future shortage of specialists:** census data show that there is likely to be an increased shortage of chest/lung radiologists in Northern Ireland over the coming five years. The number of consultants specialising in chest/lung radiology expected to retire within five years outnumbers new consultants entering the workforce in Northern Ireland choosing to specialise in this area.

*Overseas recruitment refers to the recruitment of all consultant radiologists who have undertaken specialty training outside of Northern Ireland.

**The UK median retirement age has been used for this forecast, as the dataset is larger and more consistent from year to year.

Figure 1 shows that, should trends from the past five years continue over the next five years, there will be approximately 149 WTE consultant clinical radiologists in post in Northern Ireland in 2024. This corresponds to workforce growth of 2% per year over the next five years. This compares to a 3% annual growth forecast across the UK as a whole. Set against the rapidly increasing demand for diagnostic imaging and interventional radiology (see Section 4), it is likely that the gap between the supply of consultant clinical radiologists and demand for radiology services in Northern Ireland will widen further.

Figure 1. Estimated supply of consultant clinical radiologists (WTE) – Northern Ireland, next five years (2019–2024)



4. Workforce demand

Demand for complex imaging has been growing over many years, driven by many factors including an aging population, increased screening to support early diagnosis initiatives and new clinical guidelines. Imaging is used routinely in many patient pathways and plays a vital role in diagnosing and monitoring many medical conditions, including cancer and stroke.

No trust in Northern Ireland was able to meet its reporting requirements within consultant clinical radiologists' contracted hours in 2019, indicating severe workforce shortages. Clinical directors of radiology departments at three of the five trusts (60%) in Northern Ireland felt there were insufficient consultant clinical radiologists in their departments to deliver a safe and effective level of patient care.

Many of the mechanisms used by radiology departments in Northern Ireland to manage shortfalls in reporting capacity incur direct and indirect costs. Two of the most commonly used methods are outsourcing of reporting to the independent sector, used by four of the five trusts in Northern Ireland in 2019 and insourcing, used by all five trusts in Northern Ireland in 2019.*

Estimated costs of outsourcing and insourcing

Combined outsourcing, insourcing and ad hoc locum expenditure has increased significantly in Northern Ireland over the past five years, though the rate of increase has slowed over the last year. In 2019 expenditure totalled £9.3 million, approaching double the £5.2 million expenditure for these activities in 2014. For context, £9.3 million is equivalent to the combined salaries of approximately three-quarters of the existing workforce in Northern Ireland (103 WTE consultants).^{2**}

Outsourcing of reporting to the independent sector amounted to over £4 million in Northern Ireland in 2019, accounting for almost half (45%) of the £9.3 million combined insourcing, outsourcing and ad hoc locum expenditure. There is significant variability across the UK in terms of outsourcing costs relative to population size, as shown in Figure 2. While UK outsourcing expenditure in 2019 equates to an estimated £1.61 per head of population, outsourcing expenditure was highest in Northern Ireland at £2.19 per head of population.

Figure 2. Outsourcing expenditure per head of population – UK countries, 2019



*Insourcing means additional paid reporting by trust radiologists outside of their contracted hours.

**Based on point five of the 2019 NHS consultant pay scales for Northern Ireland..

Insourcing expenditure totalled £2.5 million in Northern Ireland in 2019. There was significant variability across the UK in terms of estimated insourcing costs relative to the size of the consultant radiology workforce. As shown in Figure 3, the UK average expenditure was £15,000 per WTE consultant radiologist, whereas expenditure in Northern Ireland was £18,000 per radiologist.

Figure 3. Insourcing expenditure per consultant clinical radiologist (WTE) – UK countries, 2019



High insourcing and outsourcing costs in Northern Ireland indicate clinical radiology workforce shortages.

Estimated shortfall of consultant clinical radiologists in Northern Ireland in 2019

There are various datasets which indicate a shortfall of consultant clinical radiologists in Northern Ireland. For consistency across the UK, the RCR currently uses the following three shortfall indicators:

- The number of consultant clinical radiologists that could be funded by insourcing/outsourcing costs in Northern Ireland in 2019 is 103.
- The number of additional consultant clinical radiologists required in Northern Ireland to meet the European average of 12.8 radiologists per 100,000 population is 32.⁴
- The number of additional interventional radiologists required to meet safe 24/7 staffing rotas is 15.^{3*}

**The number of additional diagnostic radiologists required to report imaging examinations carried out in Northern Ireland in 2019 is five. For methodology, see Table 10 of the UK clinical radiology workforce census 2019 report.¹ Please note, the methodology used does not take into account any differences in radiology working practices across the UK, notably that specialty trainees do not currently independently report CT and MRI examinations in Northern Ireland.*

Using the average of all three shortfall estimates, the shortfall of in Northern Ireland is estimated to be 52 consultant clinical radiologists (WTE). This equates to a 27% workforce shortfall.

Unless timely action is taken, the current shortfall is forecast to increase in line with increasing demand for diagnostic imaging, greater complexity and diversity of imaging studies and rising demand for interventional radiology services in Northern Ireland over the next five years.

5. Workforce scenarios and potential solutions for Northern Ireland

This section considers the impact that various scenarios could have on the estimated shortfall of 52 consultant clinical radiologists in Northern Ireland.

Table 2 shows the forecast WTE increase over a five-year period under various scenarios and estimates the shortfall that would be addressed under each.

As shown in Table 2, increasing training places and incentivising consultants to delay retirement would have the most significant impact on the capacity of the workforce in five years' time. If all the following measures were realised, this would eliminate all of the current radiologist workforce shortfall in Northern Ireland. Northern Ireland would then be much better placed to respond to the increasing demand for radiology services.

Table 2. Workforce capacity scenarios for Northern Ireland, next five years

Scenario	Estimated increase in WTE consultants over five years	Proportion of 2019 workforce shortfall met*
Training		
Increase annual training places from 10 to 15*	19	38%
Reduce training attrition from 10% to 5%	2	4%
Recruitment		
Increase overseas recruitment by 50%	8	16%
Retention		
Incentivise consultants to retire at 65 (increase from 60)	19	38%
Increase staff retention – halve attrition for reasons other than retirement	3	6%
Total	51	102%

[Please note, trainees who start training in five years' time are forecast to finish training in approximately 11 years' time. To present the data clearly, this time lag is not demonstrated in Table 2.]

**Ten is the average number of trainees starting specialty training in clinical radiology in Northern Ireland each year between 2017 and 2019.*

Action has already begun to address the workforce shortage in Northern Ireland, with incremental expansion of clinical radiology training places. In addition, trusts are working to increase staff retention. These measures should begin to close the gap between the workforce supply and the demand for diagnostic and interventional radiology services. However, further significant action is required to eliminate the current radiology workforce shortages and reduce the risks of delayed diagnoses and treatment for patients.

References

1. The Royal College of Radiologists. *Clinical radiology UK workforce census 2019 report*. London. The Royal College of Radiologists, 2020.
 2. Department of Health. *Pay and conditions of service: remuneration of hospital medical and dental staff, doctors and dentists in public health, the community health service, and salaried dental staff*. Belfast: Department of Health, 2020.
 3. British Society of Interventional Radiology and The Royal College of Radiologists. *Provision of interventional radiology services, second edition*. London The Royal College of Radiologists, 2019.
 4. <https://ec.europa.eu/eurostat/data/database> (last accessed 4/8/20)
 5. www.nisra.gov.uk/sites/nisra.gov.uk/files/publications/MYE19-Bulletin.pdf (last accessed 22/7/20)
-

Appendix A. Regional workforce data table

Table 3 presents a summary of RCR 2019 clinical radiology workforce census data for Northern Ireland.

Table 3. Consultant radiologists, Northern Ireland, 2019

	Northern Ireland	UK
Number of trusts/health boards (included in census)	5	171
Clinical directors' views		
Proportion who think there are insufficient radiologists to deliver safe and effective patient care	60%	71%
Workforce		
Consultant clinical radiologists (headcount)	144 (137 WTE)	4,076 (3,732 WTE)
Trainees (headcount)	51	1,636
SAS-grade doctors (headcount)	0	83
Total headcount (consultants, trainees and SAS-grade doctors)	195	5,795
IRs as % of WTE workforce	13% (18 WTE)	18% (666 WTE)
Locums as % of workforce	10%	6%
Trainees as % of workforce	26%	29%
Workforce trends		
Percentage of WTE workforce forecast to retire within five years*	19%	20%
Percentage of IR WTE workforce forecast to retire within five years	17%	20%
IR annual workforce growth (average – past five years)	3%	4%
Annual workforce growth (average – past five years)	3%	4%
Vacancy rate	16%	11%
% workforce loss due to LTFT working	5%	8%

	Northern Ireland	UK
Programmed activities (PAs)		
Mean PAs per week (full-time NHS consultants)	11.0	10.8
<i>of which are direct clinical care</i>	9.2	8.7
<i>of which are supporting professional activities</i>	1.8	2.0
Imaging examinations (financial year 2018–2019)		
Computed tomography (CT) examinations	205,153	6,745,155
Magnetic resonance imaging (MRI)	110,017	4,457,137
X-rays	1,005,446	27,938,012
Population		
Population (2019) ⁵	1,893,700	66,796,800
WTE radiologists per 100,000 population (excludes trainees)	7.2	5.6
WTE radiologists per 100,000 population (includes trainees) European average is 12.8 ⁴	9.9	8.0
WTE IRs per million population (excludes trainees)	10	10
Outsourcing/insourcing costs (financial year 2018–2019)		
Outsourcing to teleradiology companies	£4,141,300	£107,761,200
Additional payments to contracted radiologists (insourcing)	£2,517,100	£56,303,700
Ad hoc locums (for excess reporting)	£2,627,400	£29,308,000
Total insourcing/outsourcing costs	£9,285,800	£193,372,800
Outsourcing expenditure per head of population	£2.19	£1.61
Insourcing expenditure per WTE consultant radiologist	£18,300	£15,100

	Northern Ireland	UK
Estimated workforce shortfall		
<i>Estimate A</i>		
IR consultant shortfall (based on six IRs per trust, excluding those with formal daytime and out-of-hours network transfer arrangements)	15	386
Consultant (diagnostic) radiologist shortfall based on volumes of imaging examinations**	5	1,202
WTE consultant shortfall (sum of above)	20	1,588
<i>Estimate B</i>		
Additional consultant radiologists required for 12.8 radiologists per 100,000 population (European average) ⁴	32	2,253
<i>Estimate C</i>		
Number of full-time radiologists that could be funded by outsourcing/insourcing costs	103	2,152
Estimated WTE consultant clinical radiologist shortfall 2019 (average of estimates A, B and C)	52	1,876
Estimated percentage shortfall 2019	27%	33%

* Based on UK median age of retirement (60 years).

** Excludes ultrasound. Calculated using 40 weeks per year, to allow for training days, annual leave and sickness. Excludes interventional radiologists.

[Due to rounding, numbers in this table may not add up precisely to the totals provided.]



The Royal College of Radiologists
63 Lincoln's Inn Fields
London WC2A 3JW

+44 (0)20 7405 1282
enquiries@rcr.ac.uk
www.rcr.ac.uk
 @RCRradiologists

The Royal College of Radiologists. *Clinical radiology Northern Ireland workforce census 2019 summary report*. London: The Royal College of Radiologists, 2020.
Ref No. BFCR(20)4

© The Royal College of Radiologists, August 2020.

The RCR is a Charity registered with the Charity Commission No. 211540

For permission to reproduce any of the content contained herein, please email: permissions@rcr.ac.uk

This material has been produced by The Royal College of Radiologists (RCR) for use internally within the specialties of clinical oncology and clinical radiology in the United Kingdom. It is provided for use by appropriately qualified professionals, and the making of any decision regarding the applicability and suitability of the material in any particular circumstance is subject to the user's professional judgement.

While every reasonable care has been taken to ensure the accuracy of the material, RCR cannot accept any responsibility for any action taken, or not taken, on the basis of it. As publisher, RCR shall not be liable to any person for any loss or damage, which may arise from the use of any of the material. The RCR does not exclude or limit liability for death or personal injury to the extent only that the same arises as a result of the negligence of RCR, its employees, Officers, members and Fellows, or any other person contributing to the formulation of the material.